

SCOPE OF CLAIMS

1. A multibeam transmitting/receiving apparatus for receiving uplink reception signals with a plurality of antennas and controlling the directivities of downlink transmission signals transmitted from the antennas based on the reception signals, wherein delay profiles for respective preset beams are
5 generated, and if the same path timing as the path timing with respect to which a maximum reception power level has been detected is detected from different delay profiles, then it is judged that a mobile station to which data is to be transmitted is present in a position displaced off the peak direction of any beams, and the directivities of the downlink transmission signals are
10 controlled based on reception antenna weights with respect to two beams from which the path timing has been detected and reception power levels obtained using two path timings.

2. A multibeam transmitting/receiving apparatus for receiving uplink reception signals with a plurality of antennas and controlling the directivities of downlink transmission signals transmitted from the antennas based on the reception signals, said apparatus comprising:
5 a searcher for generating delay profiles for respective preset beams using the reception signals, detecting the path timings of a plurality of multipaths from the generated delay profiles for the respective beams, and outputting the detected path timings and a beam number with respect to which the path timing is detected;
10 a plurality of signal processing means each comprising a reception multibeam controller for outputting reception antenna weights corresponding

to the beam numbers indicated from said searcher, a delay unit for delaying said reception signals by a given time based on the path timing set by said searcher, a reception beam former for weighting and combining the
15 reception signal delayed by said delay unit using the reception antenna weight indicated from said reception multibeam controller, and a signal power measuring unit for measuring reception signal power level of the signal weighted and combined by said reception beam former;
a transmission antenna weight generator for detecting a maximum
20 reception signal power level from the reception signal power levels indicated from the respective signal power measuring units of said signal processing means, determining whether the same path timing as the path timing set in a first signal processing means in which the maximum reception signal power level is obtained is present in the path timing set in another signal processing
25 means or not, and, if the same path timing as the path timing set in the first signal processing means is set in the other signal processing means, generating transmission antenna weights based on the reception power level of said first signal processing means, the reception power level of second signal processing means in which the same path timing as the path timing
30 set in the first signal processing means is set, and reception antenna weights set in said first and second signal processing means; and
a transmission beam former for weighting and combining the transmission signals using the transmission antenna weights generated by said transmission antenna weight generator.

3. A multibeam transmitting/receiving apparatus for receiving uplink reception signals with a plurality of antennas and controlling the directivity of downlink transmission signals transmitted from the antennas based on the reception signals, said apparatus comprising:

5 a searcher for generating delay profiles for respective preset beams using the reception signals, detecting the path timings of a plurality of multipaths from the generated delay profiles for the respective beams, and outputting the detected path timings, beam numbers with respect to which the path timing is detected, and reception power levels of respective fingers
10 which are obtained when respective path timings are detected;

 a plurality of signal processing means each comprising a reception multibeam controller for outputting reception antenna weights corresponding to the beam numbers indicated from said searcher, a delay unit for delaying said reception signals by a given time based on the path timing set by said
15 searcher, and a reception beam former for weighting and combining the reception signals delayed by said delay unit using the reception antenna weights indicated from said reception multibeam controller;

 a transmission antenna weight generator for detecting a maximum reception signal power level from the reception signal power levels for
20 respective fingers indicated from said searcher, selecting a first finger in which the maximum reception signal power level is obtained, determining whether the same path timing as the path timing set in said first finger is present in the path timing set in another finger or not, and if the same path timing as the path timing set in said first finger is set in the other finger,
25 generating a transmission antenna weight based on the reception power level of said first finger, the reception power level of a second finger in which

the same path timing as the path timing set in said first finger is set, and
reception antenna weights set in said first and second fingers; and

a transmission beam former for weighting and combining the
30 transmission signals using the transmission antenna weights generated by
said transmission antenna weight generator.

4. A multibeam transmitting/receiving apparatus according to claim 2,
wherein said transmission antenna weight generator generates transmission
antenna weight using the angle of direction of a preset beam corresponding
to said beam number.

5. A multibeam transmitting/receiving apparatus according to claim 3,
wherein said transmission antenna weight generator generates transmission
antenna weights using the angle of direction of a preset beam corresponding
5 to said beam number.

6. A multibeam transmitting/receiving method of receiving uplink
reception signals with a plurality of antennas and controlling the directivities
of downlink transmission signals transmitted from the antennas based on
5 the reception signals, said method comprising the steps of:

generating delay profiles for respective preset beams;

if the same path timing as the path timing with respect to which a
maximum reception power level has been detected is detected from different
delay profiles, judging that a mobile station to which data is to be transmitted
10 is present in a position displaced off the peak direction of any beams; and
controlling the directivities of a downlink transmission signal based on

reception antenna weights with respect to two beams from which the path timing has been detected and reception power levels obtained using two path timings.

7. A multibeam transmitting/receiving method of receiving uplink reception signals with a plurality of antennas and controlling the directivities of downlink transmission signals transmitted from the antennas based on the reception signals, said method comprising the steps of:

5 generating delay profiles for respective preset beams using said reception signals;

 detecting path timings of a plurality of multipaths from the generated delay profiles for respective preset beams, and assigning signal processing means to the respective path timings;

10 delaying said reception signals by a given time based on the path timings set in the respective signal processing means;

 weighting and combining the reception signals which have been delayed by the given time, using reception antenna weights corresponding to beam numbers of beams in which said path timings are detected, and

15 measuring reception signal power levels of the weighted and combined signals;

 detecting a maximum reception signal power level from the measured reception signal power levels;

20 determining whether the same path timing as the path timing set in a first signal processing means in which the maximum reception signal power level is obtained is present in the path timing set in another signal processing means or not;

if the same path timing as the path timing set in the first signal processing means is set in the other signal processing means, generating a
25 transmission antenna weight based on the reception power level of said first signal processing means, the reception power level of second signal processing means in which the same path timing as the path timing set in the first signal processing means is set, and reception antenna weights set in said first and second signal processing means; and
30 weighting and combining transmission signals using the generated transmission antenna weights.

8. A multibeam transmitting/receiving method of receiving uplink reception signals with a plurality of antennas and controlling the directivities of downlink transmission signals transmitted from the antennas based on the reception signals, said method comprising the steps of:

5 generating delay profiles for respective preset beams using said reception signals;

detecting path timings of a plurality of multipaths from the generated delay profiles for respective preset beams, and assigning signal processing means to the respective path timings;

10 delaying said reception signals by a given time based on the path timings set in the respective signal processing means;

weighting and combining the reception signals which have been delayed by the given time, using reception antenna weights corresponding to beam numbers of beams in which said path timings are detected;

15 detecting a maximum reception signal power level from the measured reception signal power levels of respective fingers which are obtained when

the path timings are detected from the generated delay profiles for respective beams;

20 selecting a first finger in which the maximum reception signal power level is obtained, and determining whether the same path timing as the path timing set in said first finger is present in the path timing set in another finger or not;

25 if the same path timing as the path timing set in said first finger is set in the other finger, generating a transmission antenna weight based on the reception power level of said first finger, the reception power level of a second finger in which the same path timing as the path timing set in said first finger is set, and reception antenna weights set in said first and second fingers; and

30 weighting and combining the transmission signals using the generated transmission antenna weights.

9. A multibeam transmitting/receiving method according to claim 7, wherein said transmission antenna weight generator generates transmission antenna weights using the angle of direction of a preset beam corresponding to said beam number.

10. A multibeam transmitting/receiving method according to claim 8, wherein said transmission antenna weight generator generates transmission antenna weights using the angle of direction of a preset beam corresponding to said beam number.